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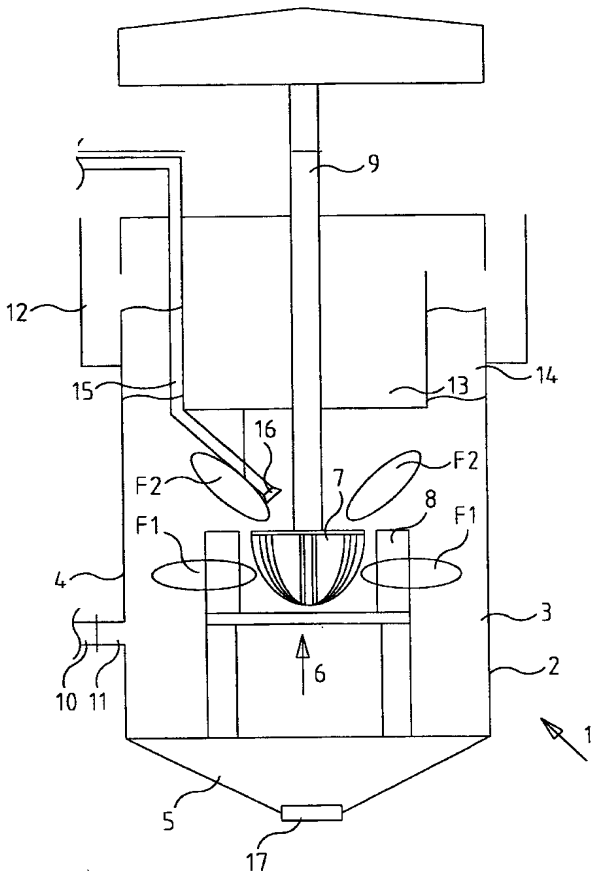
(54) Title: FLOTATION MACHINE AND METHOD FOR IMPROVING FLOTATION EFFECT



(57) Abstract: The invention relates to a flotation machine and method for improving flotation effect in the flotation machine which is provided with members for feeding material (11, 51) to be treated in the flotation machine, members for removing the treated material out of the flotation machine at least in the upper part (12, 52) of the flotation machine and in the bottom part (17, 57) of the flotation machine, a mixing mechanism (16, 46) comprising a stator (8, 48) and a rotor (7, 47) located inside the machine, air supply means (9, 49) for supplying air to the mixing mechanism and forming a froth bed (14, 45) in the upper part of the flotation machine, at least one member (13, 53) for adjusting free space of the froth bed created in the flotation machine. According to the invention a conducting member (15, 21, 55) is installed inside the flotation machine in order to add flowing material for slurry dilution in the slurry area essentially above the top part of the rotor (7, 47), but below the froth zone (14, 54).

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FLOTATION MACHINE AND METHOD FOR IMPROVING FLOTATION EFFECT

The invention relates to a flotation cell and a method for improving flotation effect in the flotation cell by feeding flowing material for slurry dilution to the top region of the cell below the froth zone.

In flotation machines, the desired valuable mineral particles are put to contact with air bubbles by means of chemicals. The air bubbles rise on the surface of the slurry layer and form a foam layer, the height whereof in free space is normally only 5 % of the height between the bottom of the flotation machine and the foam outlet froth lip.

The US patent 5,039,400 relates to a flotation machine where the slurry and froth space is provided with at least one downwards narrowing member, whereby the froth volume and the froth surface area can be regulated in order to form a thick froth bed. The height of this froth bed is between 20-40 % of the total height of the flotation cell. Inside the froth bed, there is further arranged a washing system for cleaning the concentrate. Owing to the downward washing effect by the process liquid, the remaining small slime-forming particles both entrained between air bubbles and on the surfaces of the froth bubbles can be removed. By means of washing liquid, the slime-forming fine particles are settled to the slurry tank of the flotation cell and are advantageously discharged through the slurry outlet provided in the bottom part of the cell.

In this US patent 5,039,400 the washing liquid, normally water, can be used also as dilution water for the slurry to be removed from the flotation machine via the bottom outlet. However, because washing liquid is fed into the froth bed, washing liquid will decrease the effect of the froth bed and thus the supply for the concentrate will be diminished, i.e. the recovery of the valuable mineral particles will be lower while the concentrate grade will increase.

The US patent 5,923,012 describes a flotation method and apparatus for treatment of cyclone sands, where a flash flotation machine is provided with a top outlet for progressive removal of the surface froth from the upper zone via a launder to provide flotation concentrate, a bottom outlet for progressive withdrawal of the relatively dense component of the slurry from the lower zone and a side outlet for proggressive removal of the relatively less dense component of the slurry from the intermediate zone in the tank.

The dilution water in the US patent 5,923,012 is fed to the flotation machine through the feed chute where from also the slurry to be concentrated is fed. The dilution water is then dispersed throughout the flotation machine. However, the main effect is directed to the pumping flows of the rotor in the lower part of the flotation machine. Thus for instance the intermediate zone of the flotation zone is not very effective as a target for the dilution water and, therefore, the slurry density in the slurry removed from the flotation machine can essentially be changed and is not advantageously maintained for further downstream treatment.

The object of the present invention is to eliminate at least some drawbacks of the prior art and to achieve a flotation machine and a method for improving flotation effect where flowing material for slurry dilution, as dilution water, is fed into a flotation machine below the froth bed, but essentially above the top part of the rotor of the flotation machine positioned in the lower part of the flotation machine. The essential features of the invention is enlisted in the enclosed claims.

In accordance with the invention, the flotation machine has members for feeding material to be treated in the flotation machine, members for removing the treated material out of the flotation machine at least in the upper part of the machine and in the bottom part of the flotation machine and a mixing

mechanism comprising a stator and a rotor located inside the cell and beneath the feeding of the material. In the flotation machine there are also air supply means for supplying air to the mixing mechanism and forming a froth bed in the upper part of the flotation machine as well as members for adjusting the free space of the froth bed created in the flotation machine. In the upper part of the flotation machine for adjusting the slurry and the froth space there is at least one downwards narrowing, advantageously conical or wedge-shaped member. In accordance with the invention dilution water is fed below the froth zone, but essentially above the top part of the rotor of the flotation machine, by installing at least one conducting member for the dilution water inside the flotation machine.

The flowing material for slurry dilution in accordance with the invention can be liquid, as water, or diluted slurry in which the solids content is advantageously smaller than in the slurry already in the flotation machine. Further, the flowing material for slurry dilution can also be an overflow received for instance from a thickener.

The conducting member for the dilution member is for instance a pipe which is installed inside the tank of the flotation machine so that the conducting member is supported by the wall of the tank or by the adjusting member for the slurry and the froth space. It is also possible to install the conducting member so that the conducting member is supported by the stator of the flotation machine or by any other suitable surface inside the tank of flotation machine. The conducting member can also be installed in the froth zone. Regardless of the supporting surface the conducting member is installed so that the flowing material for slurry dilution, as dilution water, is directed into the slurry essentially above the top part of the rotor of the flotation machine, but below the froth zone.

In one embodiment for the dilution water to be fed into the flotation machine in accordance with the invention at least one adjusting member for the slurry and

the froth space is provided with means to direct the dilution water to the area beneath the froth bed. The means is advantageously at least one conducting member which is installed to the outer surface of the adjusting member and the dilution water flows through the conducting member and is directed into the slurry. The dilution water can also be fed to the flotation machine by at least one conducting member which is installed inside the adjusting member. An opening is formed in the adjusting member in order to allow only the end part of the conducting member to be placed outside of the adjusting member. In accordance with one embodiment of the invention the conical part of the adjusting member operates as a vessel where from the dilution water is fed to the slurry positioned in the end part of the cone placed inside the slurry. Advantageously in any embodiments of the invention at least one nozzle is installed in that end of the conducting member which end is immersed in the slurry.

When feeding the dilution water in accordance with the invention to the top of the rotor the dilution water is sucked out of the conducting member by rotor flows which are directed to the top part of the slurry area of the flotation machine. Because the dilution water is fed essentially directly to the area where the dilution water has the advantageous effect for further treatment of the material to be removed from the flotation machine, the amount of the dilution water is also diminished.

The diminished amount of the dilution water makes it possible to obtain a higher bottom outlet density for the non-flotatable material. It also allows the froth concentrate being removed from the upper zone to contain a higher proportion of valuable mineral. Because the dilution water is under the effect of the secondary rotor flows, the effect of the dilution water is diminished in the lower part of the flotation machine in the area of the primary rotor flows and thus the density for the non-flotatable material in the bottom outlet is still high and advantageous for further treatment. The result therefrom is a low density area in the top part, beneath the froth bed of the flotation machine.

The invention is described in more details in the following drawings wherein

Fig. 1 illustrates one preferred embodiment of the invention as a schematic side-view,

Fig. 2 illustrates another preferred embodiment of the invention as a schematic side-view,

Fig. 3 illustrates further another preferred embodiment of the invention as schematic side-view,

Fig. 4 illustrates still further another preferred embodiment of the invention as schematic sideview.

According to the Fig. 1, in a flotation cell 1 a tank 2 contains slurry 3 to be treated. The tank 2 is defined by side walls 4, a conical bottom section 5, and an open top. An agitation mechanism 6 containing a rotor 7 and a stator 8 is installed inside the tank 2. The rotor 7 is rotated by a drive shaft 9. In order to create a froth bed in the top part of the tank 2, air supply means is arranged in the tank 2 using the hollow drive shaft 9 wherethrough the air is brought to the rotor 7.

The slurry is fed through the pipe 10 to the inlet 11 positioned in the lower part of one side wall 4 of the tank 2. In the bottom section 5 of the tank 2 a bottom outlet 17 for non-flotatable material is placed. The froth 14 created in the tank 2 is overflowed via a froth lip 12 which is installed outside of the top part of the side walls 4. On the top part of the tank 2 there is also installed an adjusting member 13 for adjusting the free space of the froth 14 and the slurry 3. The adjusting member 13 is provided with a pipe 15 for dilution water installed on that surface of the adjusting member 13 which is in contact with the froth 14 and the slurry 3. The pipe 15 is so installed that the end of the pipe 15 which is positioned inside the tank 2 is close to the top part of the rotor 7. The pipe 15 is further provided with at least one nozzle 16 on that end which is positioned inside the tank 2.

When operating the flotation cell 1, the slurry 3 to be treated is fed from the inlet 11 and the rotor 7 is mixing and aerating the slurry 3. The rotor 7 causes in the slurry 3 at least two different flows; primary flows F1 and secondary flows F2 whereof the flows F1 have main effect in the vicinity of the rotor 7 and the stator 8. The flows F2 have main effect in the slurry 3 in the area between the rotor 7 and the froth 14 in the top part of the tank 2. The dilution water is fed through the pipe 15 into the slurry 3 in the area where the flows F2 have their main effect. The dilution water has thus influence with the area of the slurry 3 where the amount of the coarse and heavy particles is rather small because owing to the primary flows F1 those coarse and heavy particles are sucked to the bottom section 5 of the tank 2. Thus the dilution water has only small effect to the density of that material removed from the tank 2 through the bottom outlet 17. Besides, the dilution water will diminish the density of the slurry 3 near the boundary between the slurry 3 and the froth 14 in order to create a stable froth 14 which is easy to remove as an overflow from the top part of the tank 2.

The embodiment of Fig. 2 is different from the embodiment of Fig. 1 in that a pipe 21 for the dilution water to the top part of the rotor 7 is installed on the internal surface of the side wall 4 of the flotation cell 1. At least one nozzle 23 has been installed to the end of the pipe 21 in order to direct the dilution water in a desired manner.

According to the embodiment of Fig. 3 the adjusting member 31 operates in its inner part as a vessel for the dilution water. Therefore, in the lower part of the adjusting member 31 there are at least one opening 32 for dilution water. The opening 32 is provided with at least one nozzle in order to direct the dilution water. For better directing of the dilution water the opening 32 can also be provided with a conducting member 33 which has at least one nozzle in the end.

In Fig. 4 in a flotation cell 41, which has a substantially circular cross-section horizontally, a tank 42 contains slurry 43 to be treated. The tank 42 is defined by a side wall 44, a conical bottom section 45, and an open top. An agitation mechanism 46 containing a rotor 47 and a stator 48 is installed inside the tank 42. The rotor 47 is rotated by a drive shaft 49. In order to create a froth bed in the top part of the tank 42, air supply means is arranged in the tank 42 using the hollow drive shaft 49 wherethrough the air is brought to the rotor 47.

The slurry is fed through the pipe 50 to the inlet 51 positioned in the lower part of the side wall 44 of the tank 42. In the bottom section 45 of the tank 42 a bottom outlet 57 for non-flotatable material is placed. In the side wall 44 below the zone where the froth bed is created there is also a side outlet 58 for removal of the relatively less dense component of the slurry 43 from the intermediate zone in the tank 42. The froth 54 created in the tank 42 is overflowed via a froth lip 52 which is installed outside of the top part of the side wall 44. On the top part of the tank 42 there is also installed at least one adjusting member 53 for adjusting the free space of the froth 54 and the slurry 43. The adjusting member 53 is provided with a pipe 55 for dilution water installed on that surface of one adjusting member 53 which is in contact with the froth 54 and the slurry 43. The end of the pipe 55 which is positioned inside the tank 42 is installed substantially close to the upper part of the rotor 47. The pipe 55 is further provided with at least one nozzle 56 on that end which is positioned inside the tank 42.

When operating the flotation cell 41, the slurry 43 to be treated is fed from the inlet 41 and the rotor 47 is mixing and aerating the slurry 43. The rotor 47 causes in the slurry 43 at least two different flows; primary flows F1 and secondary flows F2 whereof the flows F1 have main effect in the vicinity of the rotor 47 and the stator 48. The flows F2 have main effect in the slurry 43 in the area between the rotor 47 and the froth 54 in the top part of the tank 42. The dilution water is fed through the pipe 55 into the slurry 43 close to the upper part of the

rotor 47 in the area where the flows F2 have the main effect. The dilution water has thus influence with the area of the slurry 43 where the amount of the coarse and heavy particles is rather small because owing to the primary flows F1 those coarse and heavy particles are sucked to the bottom section 45 of the tank 42. Thus the dilution water has only small effect to the density of that material removed from the tank 42 through the bottom outlet 57 but the dilution water has much greater effect to the density of that material to be removed through the side outlet 58 and thus to the density of the material in the froth bed 54. This is because the dilution water will diminish the density of the slurry 43 near the boundary between the slurry 43 and the froth 54 in order to create a stable froth 54 which is easy to remove as an overflow from the top part of the tank 42.

Example

In order to show the effectiveness of the invention in comparison with the prior art, tests were prepared in the flotation cell of the embodiment of Fig. 4 where part of the slurry was removed from an outlet positioned in the side wall of the flotation cell. The dilution water rate for the tests were 14 m^3/h. In accordance with the invention, the dilution water was added through the adjusting member, while in accordance with the prior art the dilution water was added through the feed chute of the slurry material to be treated in the flotation cell.

As a results from the tests the following values were achieved:

Depth from froth lip	Invention % by weight solids	Prior art % by weight solids
250 mm	27.52	51.83
500 mm	28.10	54.06
750 mm	26.47	57.83
1000 mm	28.20	71.44
1250 mm	67.12	72.09
1500 mm	69.38	72.66
1750 mm	72.55	73.84

Owing to the low solid content the froth bed will be more stable than in the prior art and this will diminish fines to be circulated in the flotation circuit.

CLAIMS

1. Flotation machine provided with

members for feeding material (11, 51) to be treated in the flotation machine,

members for removing the treated material out of the flotation machine at least in the upper part (12,52) of the flotation machine and in the bottom part (17, 57) of the flotation machine,

a mixing mechanism (16,46) comprising a stator (8,48) and a rotor (7,47) located inside the machine,

air supply means (9,49) for supplying air to the mixing mechanism and forming a froth bed (14,54) in the upper part of the flotation machine,

at least one member (13,53) for adjusting free space of the froth bed created in the flotation machine,

characterised in that a conducting member (15,21,55) is installed inside the flotation machine in order to add flowing material for slurry dilution in the slurry area essentially above the top part of the rotor (7,47), but below the froth zone (14,54).

2. Flotation machine according to claim 1, **characterised** in that the conducting member (15,21,55) is installed on the outer surface of the adjusting member (13,53).

3. Flotation machine according to claim 1, **characterised** in that the conducting member (15,21,55) is installed inside the adjusting member (13,53).

4. Flotation machine according to claim 1, **characterised** in that the conducting member (15,55) is installed on the internal side wall (4,44) of the flotation machine (1,41).

5. Flotation machine according to claim 1, **characterised** in that the conducting member (15,55) is installed in the froth zone (14,54).

6. Flotation machine according to claim 1, **characterised** in that the adjusting member (13,43) is an adding vessel for water to be added.

7. Method for improving flotation effect in the flotation machine according to the claim 1 provided with

members (11,51) for feeding material to be treated in the flotation machine,

members for removing the treated material out of the flotation machine at least in the upper part (12,52) of the flotation machine and in the bottom part (17,47) of the flotation machine,

a mixing mechanism (6,46) comprising a stator (8,48) and a rotor (7,47) located inside the machine,

air supply means (9,49) for supplying air to the mixing mechanism and forming a froth bed (14,54) in the upper part of the flotation machine,

at least one member (13,53) for adjusting free space of the froth bed (14,54) created in the flotation machine,

characterised in that flowing material for slurry dilution into the flotation machine (1,41) is fed into the slurry area above the top part of the rotor (7,47) by a conducting member (15,21,55) installed inside the flotation machine (1,41).

8. Method according to claim 7, **characterised** in that flowing material for slurry dilution to be fed is conducted through a conducting member (15,21,55) connected to the adjusting member (13,53).

9. Method according to claim 7 or 8, **characterised** in that flowing material for slurry dilution to be fed is conducted through a conducting member (15,21,55) connected to the outer surface of the adjusting member (13,53).

10. Method according to claim 7 or 8, **characterised** in that flowing material for slurry dilution to be fed is conducted through a conducting member (15,21,55) connected to the inner surface of adjusting member (13,53).

11. Method according to claim 7, **characterised** in that flowing material for slurry dilution to be fed is conducted through a conducting member (15,21,55) connected to the internal surface of the side wall (4,44) of the flotation machine (1,41).

12. Method according to claim 7, **characterised** in that the adjusting member (13,53) is used as an adding vessel for flowing material for slurry dilution to be fed.

13. Method according to any of the claims 7 - 12, **characterised** in that flowing material for slurry dilution is water.

14. Method according to any of the claims 7 - 12, **characterised** in that flowing material for slurry dilution is slurry.

15. Method according to any of the claims 7 - 12, **characterised** in that flowing material for slurry dilution is an overflow of a thickener.

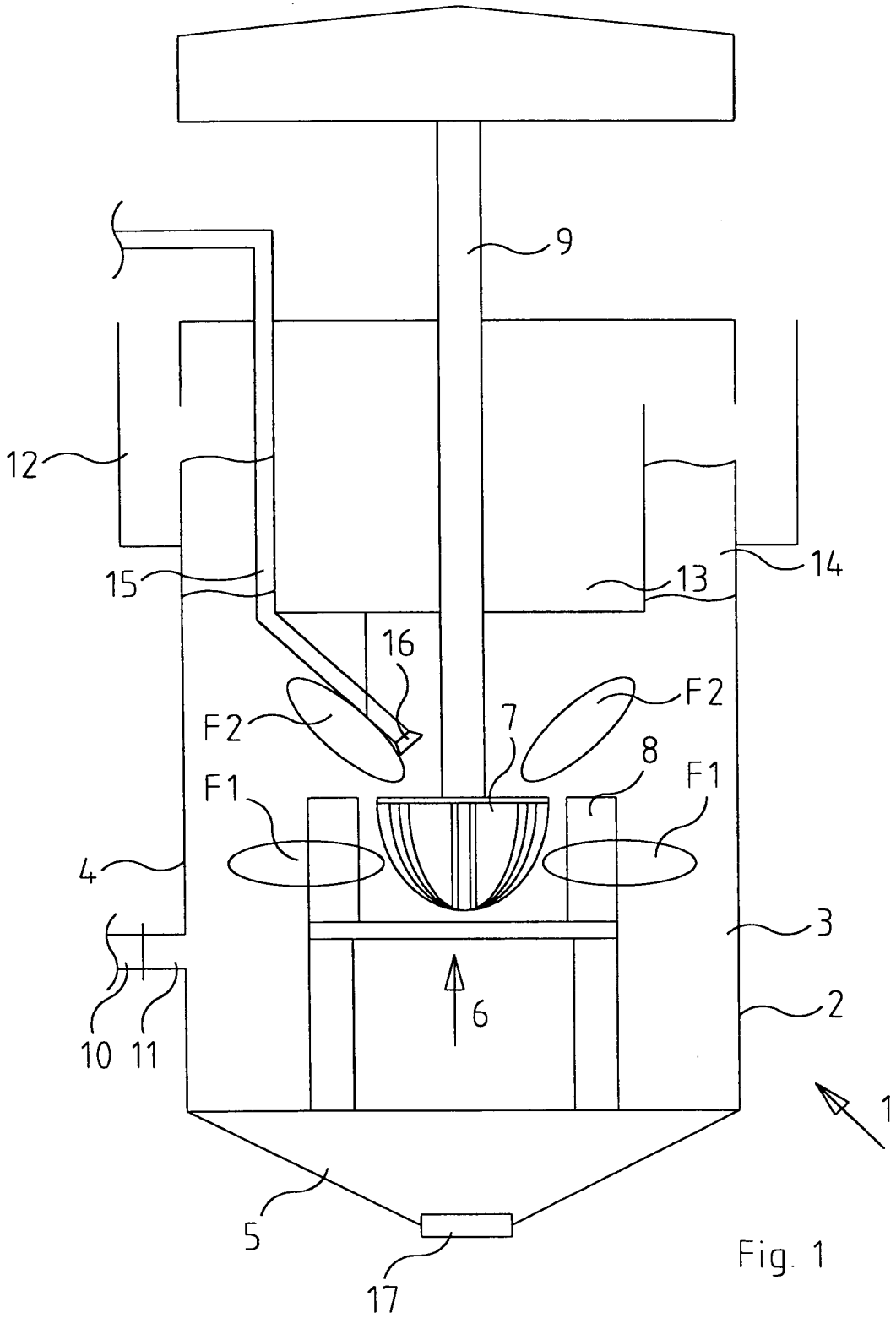

Fig. 1

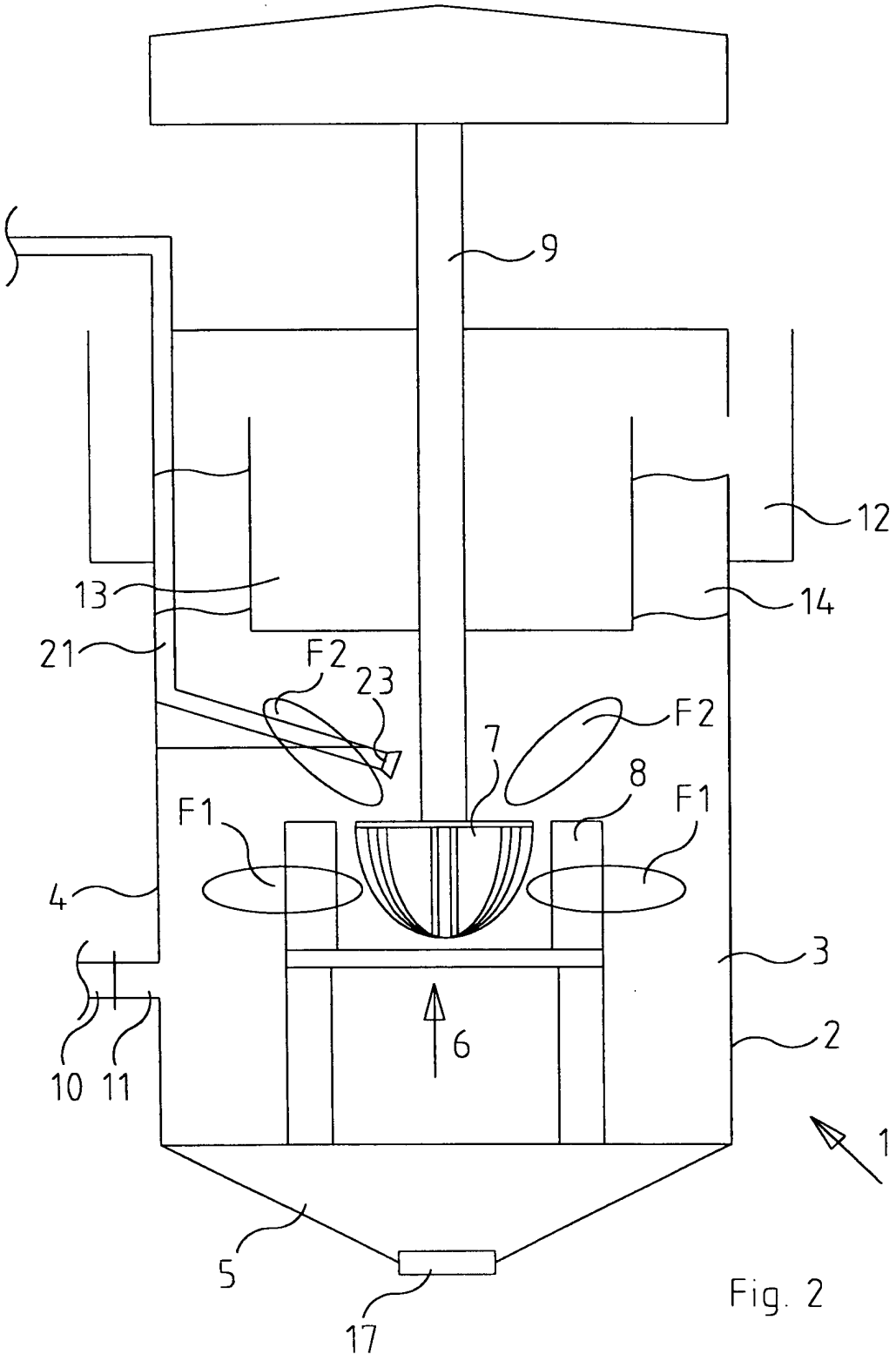

Fig. 2

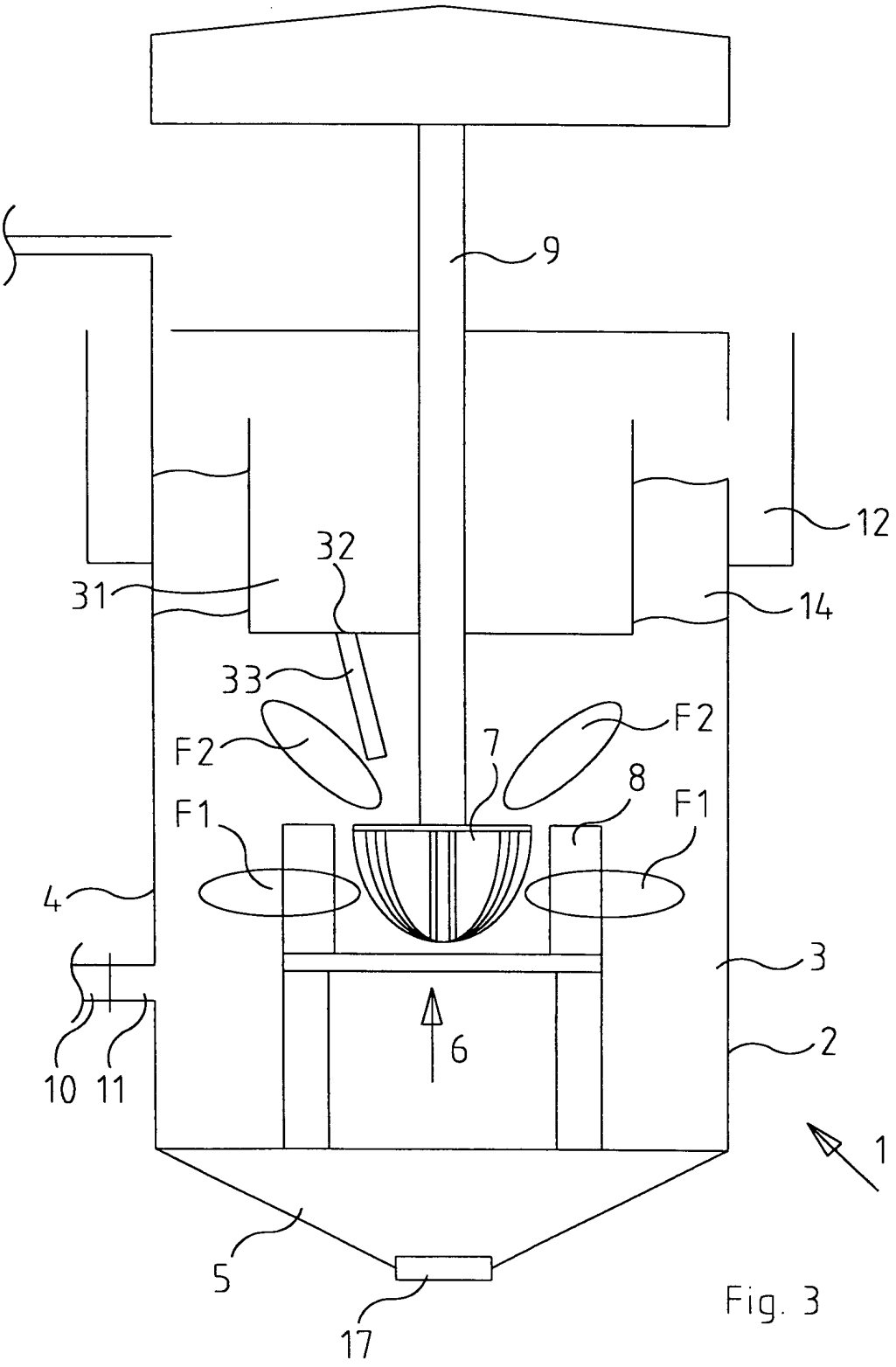

Fig. 3

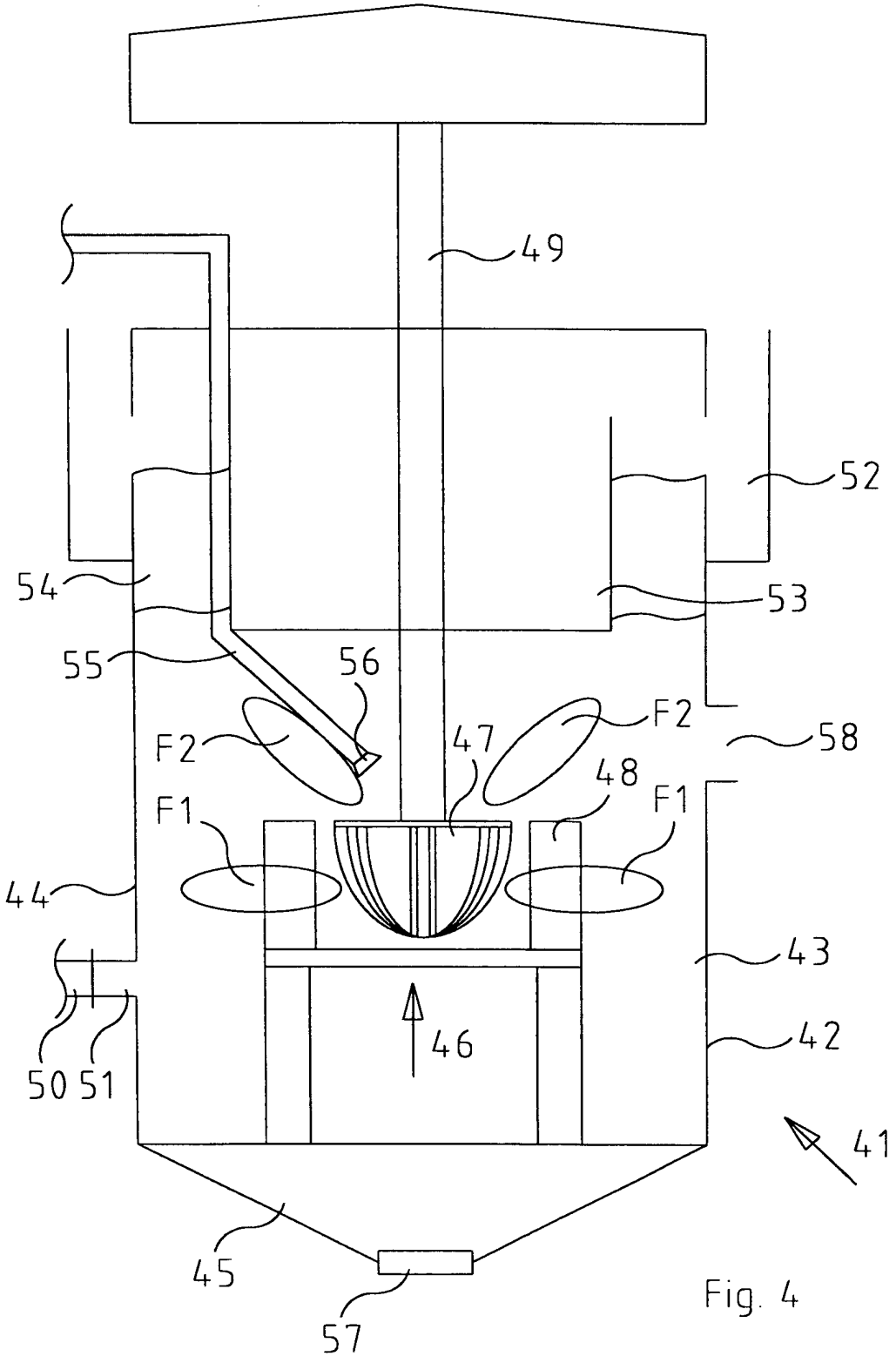

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/01090

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B03D 1/14, B03D 1/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5039400 A (JOUKO O. KALLIOINEN ET AL), 13 August 1991 (13.08.91), column 1, line 63 - column 2, line 51, figures 1,2, abstract --	1,4,5,7,11, 13-15
Y	Derwent's abstract, No 85-215869/35, week 8535, ABSTRACT OF SU, 1138-192 A (KUZNT COAL ERRICHM), 7 February 1985 (07.02.85) --	1,4,5,7,11, 13-15
A	US 5472094 A (KAZIMIERZ SZYMOCHA ET AL), 5 December 1995 (05.12.95), column 3, line 3 - column 4, line 36, figures 3,4 -- --------	1-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 February 2001	05 -03- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ulf Nyström/MP Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

05/02/01

International application No.
PCT/FI 00/01090

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5039400 A	13/08/91	AU 606216 B	31/01/91
		AU 2345888 A	13/04/89
		CA 1337774 A	19/12/95
		ES 2011139 A	16/12/89
		FI 78628 B,C	31/05/89
		FI 874415 A	08/04/89
		MX 169533 B	09/07/93
		SE 469877 B,C	04/10/93
		SE 8803386 A	08/04/89
		SU 1811422 A	23/04/93
		YU 187388 A	30/04/90
US 5472094 A	05/12/95	US 5601703 A	11/02/97

DERWENT-ACC-NO: 2001-398095

DERWENT-WEEK: 200615

TITLE: Flotation cell for treating, e.g. cyclone sand, includes pipe for adding flowing material to top region of cell below froth bed for slurry dilution

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PATENT-ASSIGNEE: OUTOKUMPU OY[OUTO] , SCHOMMARZ K[SCHOI]

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PATENT-FAMILY:

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WO 0143881 A1	June 21, 2001	EN
FI 9902675 A	June 15, 2001	FI
AU 200123761 A	June 25, 2001	EN
FI 107782 B1	October 15, 2001	FI
NO 200202825 A	July 22, 2002	NO
BR 200016345 A	September 10, 2002	PT
EP 1259328 A1	November 27, 2002	EN
NZ 519282 A	May 30, 2003	EN
US 20030111394 A1	June 19, 2003	EN
CN 1409656 A	April 9, 2003	ZH
ZA 200204235 A	December 31, 2003	EN
US 6708827 B2	March 23, 2004	EN
MX 2002005821 A1	December 1, 2003	ES
AU 780199 B2	March 10, 2005	EN
MX 225012 B	December 15, 2004	ES
CN 1167513 C	September 22, 2004	ZH

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APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO2001043881A1	N/A	2000WO-FI01090	December 13, 2000
FI 9902675A	N/A	1999FI-002675	December 14, 1999
FI 107782B1	N/A	1999FI-002675	December 14, 1999
BR 200016345A	N/A	2000BR-016345	December 13, 2000
CN 1409656A	N/A	2000CN-817146	December 13, 2000
CN 1167513C	N/A	2000CN-817146	December 13, 2000
EP 1259328A1	N/A	2000EP-987510	December 13, 2000
NZ 519282A	N/A	2000NZ-519282	December 13, 2000
NO 200202825A	N/A	2000WO-FI01090	December 13, 2000
BR 200016345A	N/A	2000WO-FI01090	December 13, 2000
EP 1259328A1	N/A	2000WO-FI01090	December 13, 2000
NZ 519282A	N/A	2000WO-FI01090	December 13, 2000

US20030111394A1	N/A	2000WO-FI01090	December 13, 2000
US 6708827B2	N/A	2000WO-FI01090	December 13, 2000
MX2002005821A1	N/A	2000WO-FI01090	December 13, 2000
MX 225012B	N/A	2000WO-FI01090	December 13, 2000
AU 200123761A	N/A	2001AU-023761	December 13, 2000
AU 780199B2	N/A	2001AU-023761	December 13, 2000
ZA 200204235A	N/A	2002ZA-004235	May 28, 2002
MX2002005821A1	N/A	2002MX-005821	June 12, 2002
MX 225012B	N/A	2002MX-005821	June 12, 2002
NO 200202825A	N/A	2002NO-002825	June 13, 2002
US20030111394A1	N/A	2002US-149778	September 25, 2002
US 6708827B2	Based on	2002US-149778	September 25, 2002

INT-CL-CURRENT:

TYPE	**IPC DATE**
CIPS	B01F15/02 20060101
CIPS	B01F3/04 20060101
CIPS	B03B13/00 20060101
CIPS	B03D1/14 20060101
CIPS	B03D1/16 20060101

ABSTRACTED-PUB-NO: WO 0143881 A1

BASIC-ABSTRACT:

NOVELTY - A flotation cell (1) comprises an inlet (11); a froth lip (12); an outlet (17); an agitator (6) comprising a stator (8) and a rotor (7); a drive shaft (9) for supplying air to the agitator and for forming a froth bed (14); adding vessel(s) (13) for adjusting free space of the froth bed; and a pipe (15) for adding flowing material above the rotor but below the froth bed for slurry dilution.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of improving flotation effect in the above flotation cell.

USE - For treating e.g., cyclone sand.

ADVANTAGE - The addition of the adding flowing material above the rotor but below the froth bed obtains a higher bottom outlet density for the non-floatable material. It allows the froth concentrate removed from the upper zone to contain a higher proportion of valuable mineral. Thus, the result is a low density area in the top part beneath the froth bed of the cell which is then easy to remove as an overflow.

DESCRIPTION OF DRAWING(S) - The figure illustrates a schematic side-view of the flotation cell.

Flotation cell (1)

Sidewall (4)

Agitator (6)

Rotor (7)

Stator (8)

Drive shaft (9)

Inlet (11)

Froth lip (12)

Adding vessel (13)

Froth bed (14)

Pipe (15)

Outlet (17)

EQUIVALENT-ABSTRACTS:

MECHANICAL ENGINEERING

Preferred Arrangement: The pipe is installed outside or inside the adding vessel, on the internal sidewall (4) of the cell, or in the froth bed.

INORGANIC CHEMISTRY

Preferred Material: The flowing material added for slurry dilution is water, slurry or an overflow of a thickener.

CHOSEN-DRAWING: Dwg.1/4

TITLE-TERMS: FLOTATION CELL TREAT CYCLONE SAND PIPE ADD FLOW MATERIAL TOP REGION BELOW FROTH BED SLURRY DILUTE

DERWENT-CLASS: J01 M25 P41

CPI-CODES: J01-K03; M25-A01B;

SECONDARY-ACC-NO:

CPI Secondary Accession Numbers: 2001-121074

Non-CPI Secondary Accession Numbers: 2001-293405